

To: Members of Dublin City Council

From: Marsha I. Grigsby, City Manager

Date: February 6, 2014

Initiated By: Terry D. Foegler, Director of Strategic Initiatives/Special Projects
Paul A. Hammersmith, PE, Director of Engineering/City Engineer
Jean-Ellen M. Willis, PE, Engineering Manager - Transportation

Re: SR 161/Riverside Drive Intersection Summary

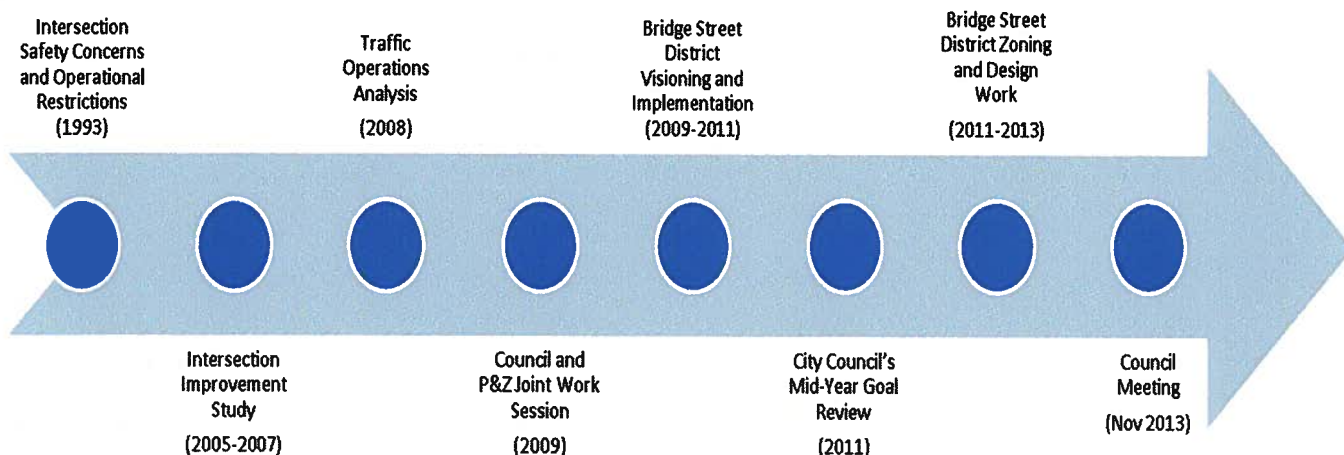
Background

At the November 18, 2013 regular Council meeting, staff was asked to compile a summary of the efforts and traffic control selection process for the US 33/SR 161/Riverside Drive intersection improvement project. In addition, staff was asked to discuss the safety aspects and advantages of roundabouts, as well as the operational relationship between the US 33/SR 161/Riverside Drive and the Bridge Street/High Street intersections.

Finally, based on a resident comment, staff was asked to investigate whether the roundabout at the Shamrock Boulevard/Village Parkway intersection provides sufficient sight distance to meet current standards.

US 33/SR 161/Riverside Drive Intersection

The US 33/SR 161/Riverside Drive intersection has been analyzed during several recent studies, namely the US 33/SR 161/Riverside Drive Intersection Improvement Study (2005-2007) and its subsequent Traffic Operations Study (2008) and the Bridge Street District project. This staff report summarizes the alternatives investigated, the conclusions of the studies, and why the roundabout solution was ultimately selected for the traffic control at the intersection of US 33/SR 161/ Riverside Drive. Below is a brief timeline of key activities.



Alternatives Analysis

Prior to the Bridge Street District planning efforts, Engineering staff had identified potential safety issues and current operational restrictions and determined that improvements would be beneficial at the US 33/SR 161/Riverside Drive intersection. Accordingly, in late 2005, Engineering undertook the "US 33/SR 161/Riverside Drive Intersection Improvement Study" that eventually analyzed several intersection improvement alternatives. This study included three intersections in its initial evaluation; US 33/ SR 161/Riverside Drive, SR 161/Dale Drive, and Riverside Drive/Dale Drive.

The purpose of the study was to assess operational considerations for intersection traffic control types for both at-grade and grade separated solutions. At-grade solutions included traffic signals, a roundabout, and the addition of turn lanes. Examples of grade separated solutions examined included a Single Point Urban Interchange (SPUI), an Urban Diamond Interchange, and a grade separated roundabout. Several alternatives were dismissed early because they did not provide acceptable levels of service, had geometric constraints, or restricted pedestrian access to the Scioto River. Completed in July 2007, the conclusions of this study were that the at-grade roundabout and lane addition alternatives to the existing intersection were both worth further consideration.

Once alternative solutions were identified, staff determined that additional study was needed to assess the cost implications and right-of-way impacts of the potential solutions. To this end, the "Traffic Operations Analysis" for SR 161/Riverside Drive began in early 2008. This study initially included the same three intersections as its predecessor and focused on several intersection operation solutions, including the recommendations of the previous study. This study also evaluated these solutions with and without the southbound bypass lane and studied combinations of signals and roundabouts.

As the study progressed in the fall of 2007, the idea of developing a riverside park and relocating Riverside Drive to the east was formulated in conjunction with the review of the Stratford Retirement Community proposal, east of Riverside Drive and just north of Dale Drive. Accordingly, the study was expanded to explore the operational impacts of signals and roundabouts at each study intersection with Riverside Drive in both its existing location and as relocated to the east. Additionally, the study identified impacts to adjacent properties if Riverside Drive was relocated, analyzed each intersection with and without the southbound bypass lane (dependent upon the location of Riverside Drive), and studied the intersection operations at the Riverside Drive and Tuller Road intersection.

The stated goals of this study were to:

- Implement roadway safety improvements
- Improve Level of Service (LOS) of intersections
- Provide for all movements at intersections
- Maximize green space/Access to the Scioto River
- Improve pedestrian connectivity
- Minimize potential bridge impacts
- Allow for future development opportunities

Ten alternatives were eventually developed on the basis of these goals.

- Alternative 1: All Roundabouts with Bypass Lane (At-Grade Roundabouts from previous study)
- Alternative 2: All Signals with Bypass Lane (Lane Additions from previous study)
- Alternative 3: Roundabout at Riverside Drive/SR 161, Signals at Dale Drive intersections with Bypass Lane
- Alternative 4: All Roundabouts without Bypass Lane
- Alternative 5: All Signals without Bypass Lane
- Alternative 6A: All Roundabouts without Bypass Lane and Riverside Drive Relocated/Peak Hour Design
- Alternative 6B: All Roundabouts without Bypass Lane and Riverside Drive Relocated/Off-Peak Hour Design
- Alternative 7A: All Signals without Bypass Lane and Riverside Drive Relocated/Peak Hour Design
- Alternative 7B: All Signals without Bypass Lane and Riverside Drive Relocated/Off-Peak Hour Design
- Alternative 8: Roundabout at Riverside Drive/SR 161, Signals at Dale Drive intersections and Riverside Drive Relocated/Peak Hour Design

The first three alternatives (1-3) were compared with respect to intersection controls by traffic signals, roundabouts, or a combination of both at the three key intersections. A key conclusion of this study was that a signal at US 33/SR 161/Riverside Drive required the replacement of the Scioto River Bridge before left turn movements from SR 161 to northbound and southbound Riverside Drive were possible.

The next two alternatives (4 and 5) eliminated the existing southbound intersection bypass, allowing for a pocket of green space to be developed adjacent to the Scioto River. These alternatives required more lanes at the intersection of SR 161 and Riverside Drive to offset the loss of the bypass lanes. Intersection controls of signals and roundabouts at the three key intersections were evaluated.

The previously discussed concepts of a relocated Riverside Drive and a riverside park led to the development of two additional alternatives (6A and 7A) that were examined to determine the impacts on nearby intersections and adjacent properties.

Alternatives (6B and 7B) were found to have very poor levels of service under peak hour traffic conditions in year 2030, and would require large expanses of pavement to accommodate that traffic. These alternatives were developed to decrease the amount of pavement, or decrease the intersection footprint, needed by designing for the off-peak traffic.

Finally, Alternative 8 was developed as a hybrid of Alternatives 3, 6A and 7A:

- From Alternative 3: the right turn drop lane on SR 161 at Dale Drive
- From Alternative 6A: the roundabout at US 33/SR 257/Riverside Drive and SR 161
- From Alternative 7: kept the signals at the Dale Drive intersections with SR 161 and SR 257/Riverside Drive, and relocated Riverside Drive to the east.

A matrix was developed to compare and weigh the pros and cons of each of these alternatives. Safety and cost were weighted as the highest level criteria in the matrix; Community Plan, bridge impacts, and level of service were rated as medium; and the bypass lane and phasing were the

least weighted factors. Many of the criteria were evaluated based on professional judgment, while cost and level of service were broken into ranges.

The alternatives were presented and discussed at the City Council and Planning and Zoning Commission Joint Work Session on February 9, 2009. A preference for Alternative 8, the roundabout solution at SR 161/Riverside Drive with signals at the Dale Drive intersections, was expressed by Council at its October 17, 2011 Mid-Year Goal Review and Bridge Street Corridor meeting. This Alternative was preferred for several reasons:

1. Allows left-turn movements from SR 161 to both northbound and southbound Riverside Drive;
2. Does not require replacement of the bridge over the Scioto River;
3. Accommodates the peak hour volume well into the future;
4. Central island provides for aesthetically appealing landscaping opportunities;
5. Pedestrians cross one direction, or fewer lanes, of travel at a time; and
6. Has the lowest construction cost of the studied intersection improvement alternatives, based on peak hour solutions.

During the Bridge Street District planning process and after the "Traffic Operations Analysis" for SR 161/Riverside Drive was completed, the area's roadway network evolved into a grid pattern, shown below in Figure 1. The grid complements the preferred alternative and maintains the same traffic controls as Alternative 8. This layout also maintains the southbound bypass lane under the bridge.



Figure 1: Grid Roadway network with preferred traffic control alternative

Safety Considerations

Roundabouts

Staff has reviewed the crash history over the past several years at intersections that have been converted to roundabouts. The statistics show overall safety is improved with this type of traffic control.

The three roundabouts carrying the most traffic in the City are at Muirfield Drive\Brand Road, Dublin Road\Brand Road, and Avery-Muirfield Drive\Post Road. The average severity ratio (the percentage of crashes resulting in an injury) at these locations has been reduced by more than 60%. The average percent of angle type collisions has been reduced by more than 50%. The average frequency and rate of crashes have also declined, as reported in Table 1.

Table 1: Roundabout Crash History			
<i>Top three roundabout locations combined</i>	Before	After	Difference
Average Crash Rate	1.67	1.11	-34%
Average Percentage of Angle Collisions	51%	25%	-51%
Average Severity Ratio	28%	11%	-61%
Average Annual Crash Frequency	10	8	-21%

Intersection of SR 161/Riverside Drive

Crash histories are typically analyzed in three year periods because they are generally sufficient to obtain a reasonable data set and should not include years when major changes to the nearby facilities or land uses occur. Table 2 shows this data for the intersection of SR 161/Riverside Drive for three periods beginning in 2003. This data reinforces the need for improvements at this intersection.

Table 2: SR 161/Riverside Drive Crash History			
<i>SR 161 & Riverside Dr.</i>	2003-2006	2006-2009	2010-2012
Crash Rate	0.96	0.90	0.98
Severity Ratio	32%	43%	16%
Crash Frequency	49	40	44

Crash Rate: About 40,000 to 50,000 vehicles use this intersection per day. When factoring in the relatively high volume of traffic at this intersection, the crash rate is about 0.98, or less than one crash per million vehicles entering. Typically, the rate becomes a concern as the number approaches or exceeds one crash per million vehicles entering.

Severity Ratio: The crashes at this intersection are frequently rear-end collisions, indicating frequent congestion, traffic back-ups, and sudden or unexpected stops. Even though the 2012 crash data indicates a substantial drop in the severity ratio, the previous six years' averaged data

indicate that nearly 40% of the crashes resulted in an injury. The average for other intersections in the city is 35%.

Crash Frequency: The SR 161/Riverside Drive intersection has consistently experienced 40 or more crashes in each previous three year period, or about one crash per month, and currently is the City's third highest crash frequency intersection.

US 33/SR 161 Corridor: Riverside Drive to High Street

Staff was asked to explain the operational relationship between the Bridge/High Streets intersection and the future US 33/SR 161/Riverside Drive intersection. The traffic control at the intersection at Bridge/High Streets is proposed to remain a signal, with a roundabout at the US 33/SR 161/Riverside Drive intersection. Successful interaction between these two intersections will be critical to traffic flowing through the US 33/SR 161/Bridge Street corridor.

The distance between Riverside Drive and High Street is about 1,100 feet. As shown in Figure 2, the roundabout improvement moves the intersection of the US 33/SR 161/Riverside Drive intersection about another 100 feet east to 1,200 feet between the intersections.



Figure 2: Riverside Drive intersection moving east with roundabout

The signal at the Bridge/High Streets intersection will act as a "meter" for traffic. Coming from the east, or from the proposed roundabout, this meter will periodically stop westbound movements while traffic waits for the signal to turn green. This will create an average westbound queue length of about 500 feet during peak hours, based on current traffic volumes and signal timings. Future traffic conditions are expected to increase the queue length to 600 feet in the peak hours. Longer queues may exist for brief periods during the day but should clear quickly. Figure 3 demonstrates the potential length for queues extending onto the Scioto River Bridge, showing that there is

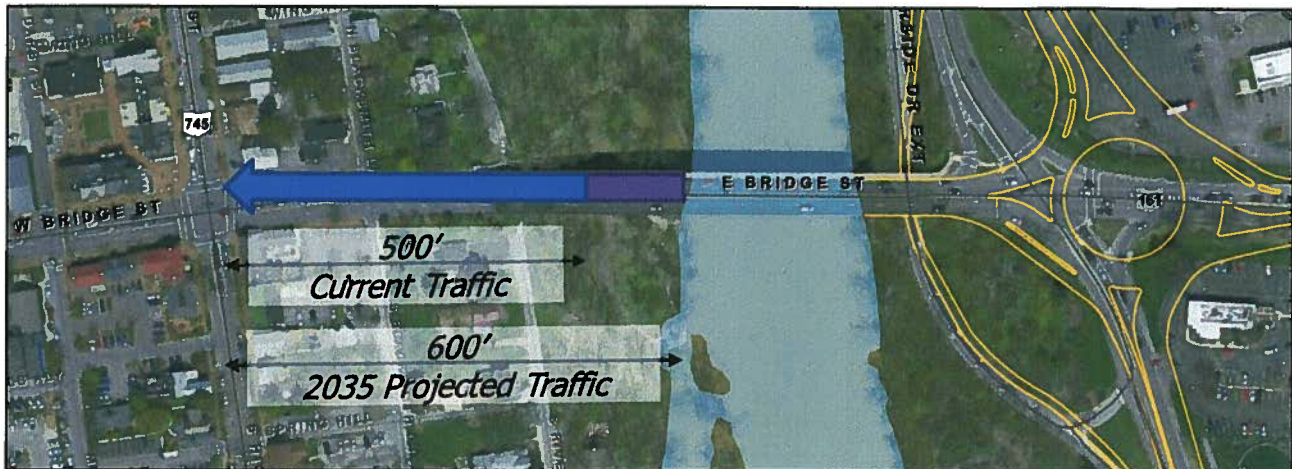


Figure 3: Bridge Street westbound peak hour predicted backup with roundabout at US 33/SR 161/Riverside Drive

sufficient space to accommodate westbound vehicles waiting for the signal at the Bridge/High Streets intersection. On occasion, traffic may back up from the Bridge/High Streets intersection and extend into the roundabout, but this is not expected on a regular basis. Special events, weather conditions, incident management or other factors may cause the extended backup.

Intersection Footprint Size Comparison

Another concern expressed during the November 18 Council meeting was the size of the footprint of a roundabout versus a traffic signal. While a roundabout has a larger footprint in the immediate vicinity of the intersection, it usually is smaller than the footprint of a signalized intersection because turn lanes must be built to store traffic waiting at the signal. A roundabout allows traffic to move more freely and does not have the same storage requirements as a traffic signal.

Figure 4 compares the footprints for the two intersection types at SR 161 and Riverside Drive, and demonstrates the overall size is about 20% smaller with the roundabout alternative compared to the traffic signal alternative.

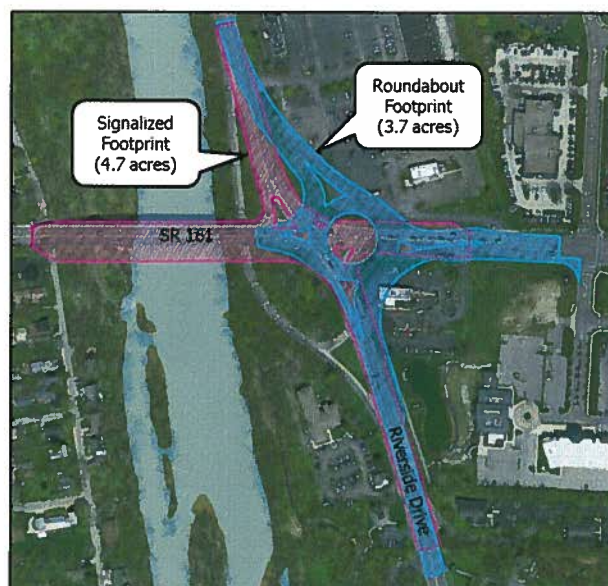


Figure 4: Intersection Footprint Comparison

Shamrock Boulevard/Village Parkway Roundabout Sight Distance

Another topic discussed at the Council meeting was the sight distance for the roundabout at Shamrock Boulevard and Village Parkway. As requested, a field and plan review of the sight distance for the roundabout was conducted. Recommended sight distance is provided for all approaches of the roundabout. Special attention was given to the southbound approach. As shown in Figure 5, landscaping in the central island has been placed to avoid affecting visibility for this approach.

One potential area for improvement for the eastbound approach is clearing the vegetation growing under the utility tower in the northwest quadrant of the intersection. Staff requested that AEP clear this area for improved visibility on the eastbound approach.



Figure 5: Intersection Shamrock/Village Parkway Sight Distance

Recommendation

Information only.